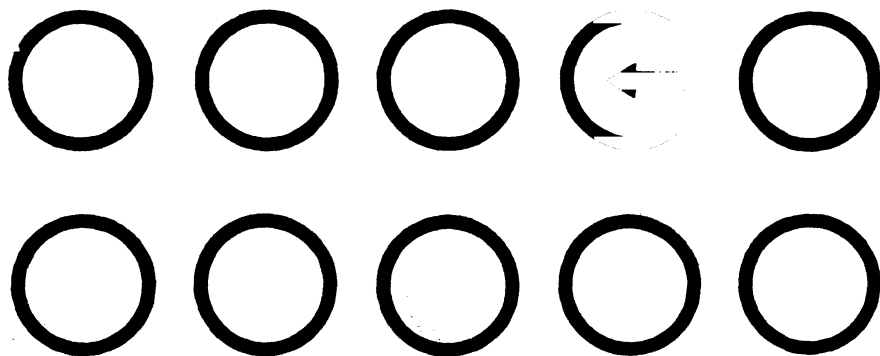


# RESEARCH ABSTRACTS



RESEARCH CELL  
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## PREFACE

The Examination Research Cell (ERC) of the Association of Indian Universities has been from time to time investigating into various fundamental issues of university examinations like Grading, Test and Item Analysis, Practical Examinations, Continuous Internal Assessment to mention only a few. Results of these research projects have already been reported in the form of Monographs, some of which have been revised in subsequent editions to include experiences of teachers/colleges/universities.

At the same time, a few research studies have been conducted and it was felt that a series of Research Abstracts should be brought out incorporating the results of such studies. The present Research Abstract is fourth in the series and it is exclusively to report the Examination result of test and item analysis of a test given by National Academy of Medical Sciences in their MNAMS Part I Examinations. What is reported here is an analysis of an objective type test of 150 items taken by 221 candidates.

A very comprehensive computer programme has been used to mark the scripts, to perform statistical analysis of the test and of various items and is also included in this Research Abstract.

It is hoped that teachers, examiners and other examining bodies will find this Research Abstract useful.

Constructive suggestions will be most welcome.

New Delhi  
10th November, 1981

V. Natarajan

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A special word of thanks is given to the National Academy of Medical Sciences & National Board of Examination, who supplied data for analysis and to Computronics India for processing the data through their computer.

**A COMPREHENSIVE STATISTICAL ANALYSIS OF  
A SAMPLE OBJECTIVE TYPE TEST.**

## USE OF OBJECTIVE TESTS

### INTRODUCTION

Objective type tests in our country are increasingly being used to serve different purposes in different situations. A beginning of it was seen in class room tests by several teachers with the main purpose of checking learning and diagnosing the weaknesses of it. Soon its use has been extended as a part of summative evaluation to check on the levels of achievement at the end of a course of study. Very recently we have seen objective type tests being used in admission and selection type tests.

While the attempts to use objective forms of assessment, have not taken roots yet, many achievement tests purely of objective forms are used particularly by organisations wanting to select a few among the many achievers of the previous qualifying courses.

In the present context therefore, this objective type test used by the National Academy of Medical Sciences for their Part-I, M'NAMS examination, is a test of attainment or proficiency in the subject of medicine, being acquired by the candidates in their previous qualifying courses. Of course the content and the intellectual abilities and skills associated with this content were all sorted out by a group of experienced and expert item writers, before assembling a collection of nearly thousand multiple-choice type items at the end of a 2 week long workshop to produce such items. One hundred and fifty of these were selected on the basis of the table of specifications and put into this test.

This test therefore deals with a certain body of contents and related intellectual abilities involved in this. The main purpose of this test is to discriminate between the more able and less able candidates on the basis of performance in the test. It is therefore imperative that the items used in the test should have a high degree of discrimination.

There are two aspects of the whole test that need to be elaborated. One of these is the "validity" of the test. By this it is meant that the items used in the test measure the identified abilities in different areas of content in a balanced manner. This is done through a table of specifications or a blueprint that specifies weightages to different areas of content and also weightages to different abilities. This largely accounts for the content validity of the test. The second of these is "reliability". By this, it is meant that the test measures consistently whatever it measures. In other words, the reliability of the test is its ability to produce more or less the same score for the same individual candidate. No test is known to have a hundred percent reliability. The coefficient of reliability is estimated by different methods. Usually the most probable value of reliability can be estimated out of all these.

Some criteria used for the Construction and Administration of this objective test: Arrangement of Items:

One method is to arrange the items in order of difficulty, usually the difficulty increases (i.e. Facility Value/ F.V. decreases) as the test proceeds. It would probably be better to form groups of items, each group containing items of approximately equal facility, rather than to try to arrange them in a fine gradation of facility from start to finish. It is a common practice to put one or two easy items at the beginning of a test on the psychological grounds that they will give candidates confidence and put them at ease. It is sometimes arranged according to some other method and let facility take care of itself.

A more common and defensible practice is to arrange items in groups corresponding to some acceptable classification of subject matter. Another criterion is that items should be grouped according to their types, if there is more than one type of item used within the test. This way all multiple choice items would be grouped together, all multiple completion would be in another group, and so on. In a mixed objective type test, this grouping by item type is essential, or it becomes confusing for a student to move at random from one type of item to another. While considering the arrangement of items one should keep an eye on the sequence of keys, that is, the letters which denote the correct response. It is usually thought to be undesirable to have a prolonged run of identical keys such as a long sequence of 'A's or even a set pattern of responses to get repeated over the items.

Lay-Out of the Test :

Clarity of lay-out is important. It is easy enough for a student to become confused when dealing with a single complex item. It is possible to arrange items in a double column on each side of the paper but only if the items themselves are short and simple. Even then, the order and numbering of the items should be logical and consistent.

Recording the Responses

There are various ways in which the responses of the candidates can be recorded. In large scale examining the use of some form of answer (response sheet) is preferred. This answer sheet may either be given separately or be detached from the testbooklet. There are three main types of answer-sheet outlined briefly below but in all the three the use of a soft lead pencil is advocated because it facilitates correction if a candidate should have a change of mind.

- 1) The first type of answer sheet requires to write the letter

or number corresponding to the chosen response to each item.  
for example :

Blank Answer Sheet

1. ☐ 2. ☐  
3. ☐ 4. ☐

Completed Answer Sheet

1. ☒ B 2. ☒ D  
3. ☒ A 4. ☒ C

- ii) In the second type of answer sheet the candidate marks usually by a circle, or a cross or a tick, the letter or number corresponding to the chosen response. For example :

Blank Answer Sheet

1. A B C D  
2. A B C D  
3. A B C D

Completed Answer Sheet

1. (A) B C D  
2. A B (C) D  
3. A (B) C D

- iii) The third type is used mainly when tests are marked by machine. It requires candidates to fill in completely a small lettered or numbered space by means of a pencil mark. When fed through a scoring machine (Scanner), which can detect the positions of the pencil marks and which is programmed to distinguish between correct and incorrect scores, each answer-sheet is automatically scored. For example :

Blank Answer Sheet

- |    | A | B | C | D |
|----|---|---|---|---|
| 1. | O | O | O | O |
| 2. | O | O | O | O |
| 3. | O | O | O | O |

Completed Answer Sheet

- |    | A | B | C | D |
|----|---|---|---|---|
| 1. | O | ● | O | O |
| 2. | O | O | O | ● |
| 3. | ● | O | O | O |

The response pattern shown in (iii) has been used in this test.

Items Analysis :

Every item in a test should contribute something to the assessment one is trying to make. In order to see that every item does indeed carry part of the load, some statistical analysis is necessary. Analysis of test items not only helps us to identify poor items, but also decide why an item is not functioning as it was planned to do. The objective type items have an advantage over most other forms of questions that their performance under operational conditions can be quantitatively analysed and evaluated after they have been used.

Item analysis yields three indices that can be calculated for every individual item . These are :

- A) Facility Value (or Difficulty Value)
- B) Discrimination Index (or Discriminating power)
- C) Effectiveness of Distractors

A) Facility Value (or Difficulty Value) :

The facility value of an item indicates how easy or difficult it proved to be and it is determined by calculating the percentage of candidates who answered it correctly. It is usually shown as a percentage and rarely as a decimal fraction.

Total number of candidates who attempted the item (N) = 90

Number of correct responses to the item (R) = 63

$$\text{Facility of this item (FV)} = \frac{\text{Number of candidates answering the item correctly}}{\text{Total Number who attempted this item.}}$$

i) if calculated in Percentage,  $FV = \frac{R}{N} \times 100$   
 $FV = \frac{63}{90} \times 100 = 70\%$

ii) if calculated in decimal fraction,  $FV = \frac{R}{N}$   
 $FV = \frac{63}{90} = 0.70$

In actual practice, a range of difficulty is allowed. e.g. between 40 and 80 percent for four option multiple choice items and 55 and 85 percent for true/false items. These limits are admittedly arbitrary and are provided only as general guidelines. If tests are used to produce a rank order, every item in the test must have a certain amount of facility. An item which is either answered correctly or incorrectly by all does not serve any useful purpose. In one case the item is too easy while it is too difficult in the other. Therefore, it is advisable to avoid both the very difficult and the very easy items.

B) Discrimination Index (or Discriminating Power)

This statistic shows the degree to which a particular item

discriminates between the higher ability and lower ability candidates. For convenience ability is here defined in terms of how well students do the test as a whole. If a particular item is to contribute to the discriminatory function of the whole test, the higher ability candidates should obtain a greater proportion of correct responses than the lower ability candidates. There are several ways in which it can be quantified. However, a simple procedure to calculate the D.I. value is given below:

1. Arrange the students in rank order according to their scores on the test as a whole.
2. One third of answer scripts at the top and the one third at the bottom are to be separated. (Very often the top 27% of total number of students and the bottom 27% of total number of students are taken for purposes of accuracy of results)
3. For each item count the number of correct responses ( $N_H$ ) obtained by the top third and count the number of correct responses ( $N_L$ ) obtained by the bottom third. If 27% is adopted, count the number of correct responses obtained by the top 27% ( $N_H$ ) and also count the number of correct responses obtained by the bottom 27%.
4. Count the number ( $n$ ) of students constituting one third of all the students who took the test. (or number of students in 27%)
5. Calculate the discrimination of the item (DI) with the help of the following formula;

$$D.I. = \frac{N_H - N_L}{n}$$

For example :

$$\begin{aligned} n &= 30 \text{ (one third of all students)} \\ N_H &= 27 \text{ i.e. 27 out of 30 answered correctly} \\ N_L &= 15 \text{ i.e. 15 out of 30 answered correctly} \\ D.I. &= \frac{27-15}{30} = \frac{12}{30} =: 0.40 \end{aligned}$$

If top and bottom 27% are adopted, we get Johnson's upper-lower index of D.I.

It follows that if an item is to contribute to the total discriminatory power of the test,  $N_H$  must be greater than  $N_L$  and, therefore, DI must be positive. The two extremes would be :

$$\begin{aligned} \text{i) } n &= 30, N_H = 30, N_L = 0 \\ \text{therefore } DI &= \frac{30 - 0}{30} = +1 \end{aligned}$$

$$\begin{aligned} \text{ii) } n &= 30, N_H = 0, N_L = 30 \\ \text{therefore } DI &= \frac{0 - 30}{30} = -1 \end{aligned}$$

$$\begin{aligned} \text{iii) } n &= 30, N_H = 20, N_L = 20 \\ \text{therefore } DI &= \frac{20 - 20}{30} = 0 \end{aligned}$$

An explanation for each of the three above mentioned cases is given below:

- i) In this case the item is discriminating positively between the higher ability and the lower ability candidates and is making maximum contribution.
- ii) In this case the item is also discriminating totally but in the opposite direction; that is the higher ability candidates on the test as a whole are answering incorrectly and vice-versa.
- iii) In this case, the item is making no distinction between the higher ability and lower ability candidates; it is having neither a positive nor a negative effect on the discriminating power of the whole test.

With a view to make a thorough study of an objective type test on the lines mentioned above, a test with 150 items was tried out on a sample of 221 medical candidates. The details of the nature of the test and its analysis are given below:

#### Test Analysis

Subject Matter and  
Nature of the test:

Medicine and Allied Sciences  
MNAMS (Primary Paper-I)  
Objective Test

Number of candidates:

221

Number of items:

150

Maximum Marks :

150

Time :

3.00 Hours

About the Test:

This is an objective type test. It consists of 150 items which are divided into three sections namely Section-'A', 'B' and 'C'.

Section - 'A'

This section contains seventy five items. Each item is of multiple-choice type and has got four suggested answers. Every item has one and only one predetermined correct answer.

Section - 'B'

This section contains forty eight items of multiple true-false type. The candidates were asked to indicate for each item whether the statement of the item is true or false.

Section - 'C'

This section contains twenty seven items. There are two statements given in each item. The first statement is in the form of an assertion while the second is in the form of a reason. The candidates were asked to choose the correct response indicating either 'A' or 'B' or 'C' or 'D' or 'E'. The candidates were given the following instructions:

- i) use 'A' if assertion is true, reason is true and reason is a correct explanation.
- ii) use 'B' if assertion is true, reason is true but reason is not a correct explanation of assertion.
- iii) use 'C' if assertion is true, reason is false.
- iv) use 'D' if assertion is false, reason is true.
- v) use 'E' if both assertion and reason are false.

With all these instructions the candidates were asked to shade the circle below the appropriate response on the answer-sheet.

Sample

The students who appeared for the part-I, MNAMS examination, were selected for studying the efficacy of the test and the efficiency of its items. A total population of 221 candidates was found suitable for the study.

### Administration

An objective type test with 150 items was administered to a sample of 221 candidates. They were given 3.00 hours to complete the test. The candidates were asked to attempt all the 150 items of the test. The candidates were further told not to write anything on the testbooklet. Separate answer-sheets were provided to every candidate which were collected from them after the allotted time.

### Scoring:

All the 221 answer-scripts were manually scored with the help of a scoring key especially designed for the test items. Each item was given 1 mark if it was correctly answered and zero mark if it was wrongly answered. In this manner all the 150 items were scored and their marks were tabulated for further analysis.

### Data Analysis

The data were analysed with the help of various statistical techniques. Different values like mean, mode, median, standard deviation, variance and standard error of the mean were calculated. The reliability of the test by various methods was calculated. The data were also analysed with the help of analysis of variance technique to provide estimates of components of variation and to make valid conclusions. Derived scores in respect of Z-scores, T-scores, AGCT, CEEB scores and percentile ranks were also worked out for all the candidates in order to derive comparable scales. Items were also analysed to find out their facility and discrimination indices.

### Interpretation of the Results:

The results of the test are interpreted in the following sequence:

#### 1) Mean, Mode, Median and Standard Deviation

The scores obtained by the candidates are first of all arranged in an order (see table 1.0) to calculate some desired values.

The range of the marks secured by the candidates in this test is found to be between 46 and 111. The minimum marks obtained by the candidates are 46 and the marks 111. The mean value of the test is 78.9. It is seen from the range of the marks that a few candidates say only 9.5 percent of the total population, have secured 100 and more than 100 out of 150 marks. Half of the candidates have secured less than 51 percent marks on the test. The median of the test which indicates the middle candidate's score on the test is 77. It signifies that 77 is that point on the scale of measurement above which are exactly half the cases and below which are the other half and it seems of course very true if we look at the marks of the candidates. The mode of the test which indicates the maximum frequency in a distribution in this case happens to be exactly

similar to the median value. As many as nine candidates have secured 77 marks out of 150. The standard deviation of the test is 15. It indicates that a majority of the candidates have secured their marks in the range of 64 to 94 and this happens to be true. As many as 65 percent of the cases are found within this range. Only 19 percent of cases are found above and 16 percent of the cases are found below this range. It also signifies that the marks obtained by the candidates are normally distributed. The standard error of the mean of the test is 1.015 which indicates that the limits of marks within which the arithmetic mean will lie if we are to give this test over and over again would be only 1.015 or it signifies that the limit of tolerance of mean is 1.015. All these values are given in Table 1.1.

Table - 1.0  
Frequency distribution of Marks<sup>+</sup>

<u>S.No.</u>	<u>Marks</u>	<u>Frequency</u>	<u>Cum Freq.</u>
1	46.00	2.00	2.00
2	50.00	1.00	3.00
3	51.00	4.00	7.00
4	53.00	4.00	11.00
5	54.00	2.00	13.00
6	55.00	2.00	15.00
7	56.00	2.00	17.00
8	57.00	1.00	18.00
9	58.00	2.00	20.00
10	59.00	3.00	23.00
11	60.00	4.00	27.00
12	61.00	3.00	30.00
13	62.00	1.00	31.00
14	63.00	3.00	34.00
15	64.00	4.00	38.00
16	65.00	5.00	43.00
17	66.00	8.00	51.00
18	67.00	5.00	56.00
19	68.00	6.00	62.00
20	69.00	4.00	66.00
21	70.00	6.00	72.00
22	71.00	6.00	78.00
23	72.00	5.00	83.00
24	73.00	1.00	84.00
25	74.00	6.00	90.00
26	75.00	7.00	97.00
27	76.00	6.00	103.00
28	77.00	9.00	112.00
29	78.00	4.00	116.00
30	79.00	2.00	118.00
31	80.00	2.00	120.00
32	81.00	3.00	123.00

<u>S. No</u>	<u>Marks</u>	<u>Frequency</u>	<u>Cum Freq.</u>
33	82.00	4.00	127.00
34	83.00	5.00	132.00
35	84.00	3.00	135.00
36	85.00	6.00	141.00
37	86.00	5.00	146.00
38	87.00	8.00	154.00
39	88.00	6.00	160.00
40	89.00	4.00	164.00
41	90.00	3.00	167.00
42	91.00	2.00	169.00
43	92.00	3.00	172.00
44	94.00	7.00	179.00
45	95.00	4.00	183.00
46	96.00	6.00	189.00
47	97.00	1.00	190.00
48	98.00	3.00	193.00
49	99.00	7.00	200.00
50	100.00	4.00	204.00
51	101.00	1.00	205.00
52	102.00	2.00	207.00
53	103.00	3.00	210.00
54	104.00	3.00	213.00
55	105.00	1.00	214.00
56	106.00	4.00	218.00
57	110.00	2.00	220.00
58	111.00	1.00	221.00

+Output from computer

Table of some desired statistics<sup>+</sup>

Table-1.1

Mean of Score	78.9005
Median of Score	77.0000
Mode of Score	77.0000
Variance of Score	226.9231
Standard Deviation	15.0640
S.D. by Dietrich Method	14.8288
Standard Error of the Mean	1.0156

+Output from computer

### Percentile Ranking

A candidate's percentile rank describes his relative standing within a specified group. A percentile is one of the ninety-nine points dividing a frequency distribution into one hundred groups of equal size. The scores which serve to identify a person's status within a specified group may be expressed in a variety of forms. One convenient way of indicating the level of an individual's performance is to quote his percentile rank. This tells us what percentage of the group performed at a lower level. Thus if we compare an individual's mark with those obtained by the group as a whole, and find that when their marks are arranged in rank order he is exactly half way down the list, he would be said to be at the 50th percentile. In other words fifty percent of the group were below him in the list. If he fared better than 90 percent of the group he would have a percentile rank of 90 and so on.

It is clear that this is a much more meaningful representation of an individual's performance than his total mark or percentage mark in an examination. Table 1.1a shows the percentile rank calculations of all the 221 candidates.

Table 1.1a showing percentile rank calculation

S. No.	Marks(x)	Frequency(f)	Cumulative Freq. (Cf)	Cumulative Freq. mid- point (Cfm)	Cumulative Percentage of mid point (P. R.)
1	111	1	221	220.50	99.77
2	110	2	220	219.00	99.09
3	106	4	218	216.00	97.73
4	105	1	214	213.50	96.38
5	104	3	213	211.50	95.70
6	103	3	210	208.50	94.34
7	102	2	207	206.00	93.21
8	101	1	205	204.50	92.53
9	100	4	204	202.00	91.40
10	99	7	200	196.50	88.91
11	98	3	193	191.50	86.65
12	97	1	190	189.00	85.74
13	96	6	189	186.00	84.16
14	95	4	183	181.00	81.90
15	94	7	179	175.50	79.41
16	92	3	172	170.50	77.14
17	91	2	169	168.00	76.01
18	90	3	167	165.50	74.88
19	89	4	164	162.00	73.30
20	88	6	160	157.00	71.04

21	87	6	154	150.00	67.87
22	86	5	146	143.50	64.93
23	85	6	141	138.00	62.44
24	84	3	135	133.50	60.40
25	83	5	132	129.50	58.59
26	82	4	127	125.00	56.56
27	81	3	123	121.50	54.97
28	80	2	120	119.00	53.84
29	79	2	118	117.00	52.94
30	78	4	116	114.00	51.58
31	77	9	112	107.50	48.64
32	76	6	103	100.00	45.24
33	75	7	097	93.50	42.30
34	74	6	090	87.00	39.36
35	73	1	084	83.50	37.78
36	72	5	083	80.50	36.42
37	71	6	078	75.00	33.93
38	70	6	072	69.00	31.22
39	69	4	066	64.00	28.95
40	68	6	062	59.00	26.69
41	67	5	056	53.50	24.20
42	66	8	051	47.00	21.26
43	65	3	043	40.50	18.32
44	64	4	038	36.00	16.28
45	63	5	034	32.50	14.70
46	62	1	031	30.50	13.80
47	61	3	030	28.50	12.89
48	60	4	027	25.00	11.31
49	59	3	023	21.50	9.71
50	58	2	020	19.00	8.59
51	57	1	018	17.50	7.91
52	56	2	017	16.00	7.23
53	55	2	015	14.00	6.33
54	54	2	013	12.00	5.42
55	53	4	011	9.00	4.07
56	51	4	007	5.00	2.26
57	50	1	003	2.50	1.13
58	46	2	002	1.00	0.45

### Reliability of the Test

The reliability of the test calculated by various methods is given below:

#### A. Split Halves Reliability

In this method the test of 150 items is split into two halves namely:

- a test of odd numbered items and a test of even numbered items.

Marks obtained by candidates in odd numbered item test and even numbered item test are all found out. Product moment correlation is worked out to give the split halves reliability.

- ii) another way of making two tests out of one is to take any random 75 items and constitute into a test while the rest will be made into another. Candidate's marks on these two tests are found and product moment correlation found out.
- iii) yet another way to have two halves of the same 150 items is to take the first 75 items as a test and last 75 as another. Candidates' marks on these first 75 and last 75 items are found and correlated.

Thus, all the 150 test items are divided into two halves by the three above mentioned methods and then the reliability by various methods is calculated. The different values are given in Table 1.2.

It is seen from Table 1.2 that the reliability of the test calculated by various methods is fairly high. In most of the cases, the reliability of the test is greater than 0.85 or approximately 0.89 which is of course a very high value for a test of this type. It further signifies that the test items are nearly equal in difficulty and hence the reliability of the test is quite high.

Table-1.2  
Reliability of the Test<sup>+</sup>

	Split halves reliability	Spearman Brown whole test reliabi- lity	Rulon Formula of reliability	Flanagan Formula of reliability
Odd even split	0.8080	0.8938	0.8907	0.8907
Random half split	0.5878	0.7404	0.7310	0.7310
First-second half	0.7740	0.8726	0.8719	0.8720
Reliability by Molser short cut method	= 0.8080			
Reliability by KR-20 formula	= 0.8753			
KR-I 20 form. Based on 27% HAG and 27% LAG	= 0.9284			
Another Form of KR-20 formula	= 0.8408			
Reliability by KR-21 formula	= 0.8408			
Cronbach Coeff. Alpha	= 0.8753			

Lower bound estimate of exam. reliability	= 0.9079
Stanley Approximation	= 0.8809
Index of Measurement efficiency	= 0.8942
Reliability by Analysis of Variance	= 0.8753
Tucker Modified KR form.	= 0.8753

+ Output from Computer

### Analysis of Variance

The data were also analysed with the help of analysis of variance technique. for which the following hypotheses were developed:

### Development of Hypotheses

In order to study the individuals marks on the test items and also to study the effect of test items on the individual candidates the following null hypotheses were formulated.

HO<sub>1</sub> The individual candidates will not vary significantly on the test items.

HO<sub>2</sub> The test items will not have any significant difference on the individuals' scores.

In order to test the hypotheses developed earlier, the analysis of variance technique was used to provide estimates of components of variation and to make valid conclusions. The summary of the complete analysis of variance is given in Table 1.3.

Table 1.3

### Analysis of Variance

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares Error	Variance Ratio
Examinees	334.3359	220	1.5197	8.0177 <sup>+</sup>
Items	1717.5039	149	11.5269	60.8139 <sup>+</sup>
Remainder	6213.2344	32780	0.1895	

+ Significant at .05 and also at .01 level.

### Analysis of Variance

To study the effect of individual student on the test items and also the effect of test items on individuals' scores, the data were analysed with the help of analysis of variance technique. The hypotheses which were formulated earlier were tested on the basis of the 'F' - values given in Table-1.3.

#### Hypothesis - I

This hypothesis states that the individual candidates will not vary significantly on the test items.

It is seen from Table 1.3 that the calculated value of 'F' in relation to examinees is greater ( $F = 8.6177$ ) than the tabulated value, therefore, the null hypothesis is rejected. It means that the individual candidates differ significantly on the test items. The 'F' ratio for examinees is significant beyond the .01 point, leaving us with considerable confidence that the examinees difference, as such, have a real bearing upon the difficulty of the items of the test.

#### Hypothesis - II

This hypothesis states that the test items will not have any significant difference on the individuals' scores.

It is seen from Table 1.3 that the calculated value of 'F' in relation to items is greater ( $F=60.8139$ ) than the tabulated value, therefore, the null hypothesis is rejected. It indicates that the test items have a significant difference on the individuals' scores. The F-ratio for items is significant beyond the .01 point, leaving us with considerable confidence that the items, as such, have a real bearing upon the individuals' scores.

### Item Analysis

#### 1. Facility Value(F. V.)

The facility value of an item indicates how easy or difficult it proved to be and is determined by calculating the percentage of candidates who answered it correctly. Usually the facility

value of an objective type test item must range from 20% to 85%. The various standards suggested to check the facility value of an objective type item are given below:

At trial test stage

0 to 25% F.V. Item is too hard (modify, check distractors)  
 25% to 75% F.V. Item of correct facility  
 75% to 100% F.V. Item is very easy (reword, reject, check for clues)

After trial but in actual use

0 to 25% topic not taught well/not learnt well  
 (check teaching learning technique)  
 25% to 75% topic reasonably taught well/learnt well  
 75% to 100% exceptionally good knowledge of topic

2. Discrimination Index (D.I.)

This is an important item analysis characteristic for an objective type test item. The quality of an item in distinguishing between higher ability and lower ability candidates is technically called discrimination. The statistics showing discrimination value is called discrimination index. These indices range from - 1.0 to +1.0. A good quality item should discriminate between candidates who have achieved well and those who have not. The main purpose of discrimination index is to tell us if an item really is showing differences between more capable candidates and less capable candidates. The various standards suggested to check the discrimination index of an objective type item are given below:

0.6 and above: excellent items  
 0.2 to 0.6: very good items  
 0 to 0.2: needs improvement  
 <0 to be discarded

Items with negative DI should be rejected.

The F.V. and D.I. for all the 150 items administered to a sample of 221 candidates were calculated, summarised and given in Table 3.0. The F.V. and D.I. values for individual items are separately given.

Qn. No.	% choosing Question	Mean Ability Index	Facility Value	Discrimination Index	Variance
94	100.0000	78.4208	0.9831	0.033898	0.008968
95	100.0000	72.2127	0.8559	0.220339	0.089638
96	100.0000	74.9050	0.9746	-0.016949	0.047296
97	100.0000	72.2851	0.9068	0.186441	0.089638
98	100.0000	51.0724	0.6271	0.203390	0.233369
99	100.0000	59.9050	0.7288	0.101695	0.189185
100	100.0000	31.8552	0.3898	0.542373	0.230953
101	100.0000	70.8959	0.8898	0.186441	0.103806
102	100.0000	48.9321	0.5932	0.576271	0.244426
103	100.0000	47.7466	0.5593	0.305085	0.242993
104	100.0000	57.6968	0.6864	0.288136	0.205729
105	100.0000	17.5204	0.2542	0.0	0.172560
106	100.0000	73.4887	0.9576	0.050847	0.067157
107	100.0000	50.1312	0.5932	0.508475	0.240536
108	100.0000	33.9140	0.4237	0.135593	0.242993
109	100.0000	4.3348	0.0847	-0.135593	0.059335
110	100.0000	62.9231	0.7966	0.372881	0.177515
111	100.0000	12.0090	0.1864	0.067797	0.123830
112	100.0000	47.8235	0.5847	0.288136	0.243730
113	100.0000	48.1584	0.6356	0.118644	0.239635
114	100.0000	40.1584	0.5424	-0.101695	0.249872
115	100.0000	69.0271	0.8559	0.254237	0.123830
116	100.0000	50.4389	0.6102	0.474576	0.239635
117	100.0000	42.3032	0.5169	0.423729	0.249954
118	100.0000	52.6516	0.6864	0.220339	0.228374
119	100.0000	33.3937	0.4831	0.050847	0.242993
120	100.0000	13.0724	0.1525	0.169491	0.130177
121	100.0000	27.3575	0.3305	0.288136	0.219652
122	100.0000	39.8959	0.5000	0.220339	0.249872
123	100.0000	63.7873	0.7712	0.186441	0.162159
124	100.0000	44.0814	0.5932	0.271186	0.248152
125	100.0000	32.5520	0.4068	0.305085	0.237710
126	100.0000	18.8461	0.2288	0.288136	0.170021
127	100.0000	22.9412	0.3136	0.457627	0.191397
128	100.0000	27.4027	0.3136	0.389830	0.216416
129	100.0000	31.6199	0.4407	0.101695	0.242993
130	100.0000	37.6832	0.5169	0.118644	0.248848
131	100.0000	20.0181	0.2203	0.033898	0.186933
132	100.0000	36.0633	0.3983	0.423729	0.244426
133	100.0000	33.1674	0.3729	0.203390	0.240536
134	100.0000	14.4118	0.1441	0.016949	0.148236
135	100.0000	15.0045	0.1610	0.152542	0.148236
136	100.0000	13.8462	0.1610	0.118644	0.139391

Qn. No.	% choosing Question	Mean Ability Index	Facility Value	Discrimination	Varlance
137	100.0000	30.0090	0.4068	0.372881	0.228374
138	100.0000	42.5565	0.4915	0.474576	0.249954
139	100.0000	24.9955	0.2797	0.322034	0.207612
140	100.0000	16.9231	0.2373	0.135593	0.162159
141	100.0000	32.6244	0.4068	0.338983	0.236686
142	100.0000	33.7104	0.3898	0.305085	0.241396
143	100.0000	34.5475	0.3814	0.457627	0.240536
144	100.0000	26.1584	0.3051	0.372881	0.209455
145	100.0000	33.8054	0.4153	0.423729	0.240536
146	100.0000	12.2217	0.1525	0.135593	0.127024
147	100.0000	19.9955	0.3136	0.186441	0.182306
148	100.0000	21.4977	0.2712	0.271186	0.186933
149	100.0000	25.8145	0.3220	0.271186	0.213018
150	100.0000	11.6063	0.1864	0.203390	0.114003

+ Output from Computer.

If one looks at the F.V. and D.I. values of individual items which are given in Table 3.0 one finds there are a few items which need further improvement. Let us look at the F.V. and D.I. of all the items separately.

It is seen from Table 3.0 that there are twenty items in the test which have got high facility values. It signifies that these items are easy items and they are correctly answered by a large number of candidates. Against this there are twelve items which have got the least facility values. It shows that these are hard items and they are correctly answered only by a few candidates (that is why their facility values are less). It is therefore statistically proved that the items in the test are proportionately included. It shows an ideal combination of some easy, some hard and some medium items. In fact easy and hard items which are contrary to each other have approximately an equal load on the test as a result of which there is a very good balance. Majority of the items are of medium difficulty and this is a very good sign of a well planned test. On the basis of these statistics we can precisely say that this test out of 150 items contains 12 hard, 20 easy and 118 medium items, which of course seems to be a very good combination. From the psychological point of view we must have some easy items in the test (preferably in the beginning of the test) so that the candidates get some positive reinforcement by solving them. If one does not give the easy items in the test, the candidates may get nervous. Since we have to discriminate the candidates of higher ability and lower ability which is the first and the foremost purpose of the test, it is also necessary to include some hard items which could be solved only by the higher ability candidates. Apart from these two types of items i.e. hard items & easy items each test should have some items of medium difficulty.

If we look at the D.I. values of the items given in Table 3.0, it is seen that there are twenty five items which have got negative D.I. values. It means that these items have failed to serve their purpose or in other words these items have failed in discriminating between the higher ability and lower ability candidates. It further signifies that these items are either to be rejected or modified. Apart from it there are thirty items in the test which have got less D.I. values. It does not necessarily mean that these items are not at all good items and therefore they should be rejected. They need further improvement and it would be possible either by changing the distractors of the items or by converting or remodifying the stems of the items.

As a whole, the test is extremely good and it could be further improved if a few items which have shown less F.V. and D.I. values are slightly modified.

#### Derived Scores

It is necessary to convert the raw score scales into other standard scales for various reasons. One objective is to effect a more reasonable scale of measurement. Another important objective is to derive comparable scales for different tests. The raw scores from each test yield numbers that have no comparability with numbers from another test. There are many situations for

wanting not only comparable values from different tests but also values that have some standard meaning. These are the problems of test norms and test standards. It is almost certain that derived scores provide us with more nearly comparable values than do raw scores. No informed person would think of using raw scores as a basis of making direct comparisons among individual positions with respect to trait variables. Conversion of raw scores to values on some other common scale is essential. Derived scores in respect of Z, T, AGCT, CEEB are worked out for all the 221 candidates. Table 2.0 summarises the results of calculations.

1. Z-scores have 0 for their mean and 1 for their standard deviation
2. T-scores are linearly transformed Z scores with mean at 50 and S.D. at 10.
3. AGCT (100/20)
4. CEEB (College Entrance Examination Board) 500/100

Table 2.0 +

S. No	Marks	Z-score	T-score	AGCT-score	CEEB-score
1	111	2.13	71.31	142.62	713.09
2	110	2.06	70.64	141.29	706.45
3	110	2.06	70.64	141.29	706.45
4	106	1.80	67.99	135.98	679.90
5	106	1.80	67.99	135.98	679.90
6	106	1.80	67.99	135.98	679.90
7	106	1.80	67.99	135.98	679.90
8	105	1.73	67.33	134.65	673.26
9	104	1.67	66.66	133.32	666.62
10	104	1.67	66.66	133.32	666.62
11	104	1.67	66.66	133.32	666.62
12	103	1.60	66.00	132.00	659.98
13	103	1.60	66.00	132.00	659.98
14	103	1.60	66.00	132.00	659.98
15	102	1.53	65.33	130.67	653.34
16	102	1.53	65.33	130.67	653.34
17	101	1.47	64.67	129.34	646.70
18	100	1.40	64.01	128.01	640.07
19	100	1.40	64.01	128.01	640.07
20	100	1.40	64.01	128.01	640.07
21	100	1.40	64.01	128.01	640.07
22	99	1.33	63.34	126.69	633.43
23	99	1.33	63.34	126.69	633.43
24	99	1.33	63.34	126.69	633.43
25	99	1.33	63.34	126.69	633.43
26	99	1.33	63.34	126.69	633.43
27	99	1.33	63.34	126.69	633.43
28	99	1.27	63.34	126.69	633.43
29	98	1.27	62.68	125.36	626.79
30	98	1.27	62.68	125.36	626.79
31	98	1.27	62.68	125.36	626.79
32	97	1.20	62.02	124.03	620.15
33	96	1.14	61.35	122.70	613.51
34	96	1.14	61.35	122.70	613.51
35	96	1.14	61.35	122.70	613.51
36	96	1.14	61.35	122.70	613.51
37	96	1.14	61.35	122.70	613.51
38	96	1.14	61.35	122.70	613.51
39	95	1.07	60.69	121.37	606.87
40	95	1.07	60.69	121.37	606.87
41	95	1.07	60.69	121.37	606.87
42	95	1.07	60.69	121.37	606.87
43	94	1.00	60.02	120.05	600.24
44	94	1.00	60.02	120.05	600.24
45	94	1.00	60.02	120.05	600.24

S. No	Marks	Z-score	T-score	AGCT-score	CEEB-score
46	94	1.00	60.02	120.05	600.24
47	94	1.00	60.02	120.05	600.24
48	94	1.00	60.02	120.05	600.24
49	94	1.00	60.02	120.05	600.24
50	92	0.87	58.70	117.39	586.96
51	92	0.87	58.70	117.39	586.96
52	92	0.87	58.70	117.39	586.96
53	91	0.80	58.03	116.06	580.32
54	91	0.80	58.03	116.06	580.32
55	90	0.74	57.37	114.74	573.68
56	90	0.74	57.37	114.74	573.68
57	90	0.74	57.37	114.74	573.68
58	89	0.67	56.70	113.41	567.04
59	89	0.67	56.70	113.41	567.04
60	89	0.67	56.70	113.41	567.04
61	89	0.67	56.70	113.41	567.04
62	88	0.60	56.04	112.08	560.41
63	88	0.60	56.04	112.08	560.41
64	88	0.60	56.04	112.08	560.41
65	88	0.60	56.04	112.08	560.41
66	88	0.60	56.04	112.08	560.41
67	88	0.60	56.04	112.08	560.41
68	87	0.54	55.38	110.75	553.77
69	87	0.54	55.38	110.75	553.77
70	87	0.54	55.38	110.75	553.77
71	87	0.54	55.38	110.75	553.77
72	87	0.54	55.38	110.75	553.77
73	87	0.54	55.38	110.75	553.77
74	87	0.54	55.38	110.75	553.77
75	87	0.54	55.38	110.75	553.77
76	86	0.47	54.71	109.43	547.13
77	86	0.47	54.71	109.43	547.13
78	86	0.47	54.71	109.43	547.13
79	86	0.47	54.71	109.43	547.13
80	86	0.47	54.71	109.43	547.13
81	85	0.40	54.05	108.10	540.49
82	85	0.40	54.05	108.10	540.49
83	85	0.40	54.05	108.10	540.49
84	85	0.40	54.05	108.10	540.49
85	85	0.40	54.05	108.10	540.49
86	85	0.40	54.05	108.10	540.49
87	84	0.34	53.39	106.77	533.85
88	84	0.34	53.39	106.77	533.85
89	84	0.34	53.39	106.77	533.85
90	83	0.27	52.72	105.44	527.21
91	83	0.27	52.72	105.44	527.21
92	83	0.27	52.72	105.44	527.21
93	83	0.27	52.72	105.44	527.21
94	83	0.27	52.72	105.44	527.21
95	82	0.21	52.06	104.12	520.58
96	82	0.21	52.06	104.12	520.58

S. No	Marks	Z-score	T-Score	AGCT-Score	CEEB-Score
97	82	0.21	52.06	104.12	520.58
98	82	0.21	52.06	104.12	520.58
99	81	0.14	51.39	102.79	513.94
100	81	0.14	51.39	102.79	513.94
101	81	0.14	51.39	102.79	513.94
102	80	0.07	50.73	101.46	507.30
103	80	0.07	50.73	101.46	507.30
104	79	0.01	50.07	100.13	500.66
105	79	0.01	50.07	100.13	500.66
106	78	-0.06	49.40	98.80	494.02
107	78	-0.06	49.40	98.80	494.02
108	78	-0.06	49.40	98.80	494.02
109	78	-0.06	49.40	98.80	494.02
110	77	-0.13	48.74	97.48	487.38
111	77	-0.13	48.74	97.48	487.38
112	77	-0.13	48.74	97.48	487.38
113	77	-0.13	48.74	97.48	487.38
114	77	-0.13	48.74	97.48	487.38
115	77	-0.13	48.74	97.48	487.38
116	77	-0.13	48.74	97.48	487.38
117	77	-0.13	48.74	97.48	487.38
118	77	-0.13	48.74	97.48	487.38
119	76	-0.19	48.07	96.15	480.75
120	76	-0.19	48.07	96.15	480.75
121	76	-0.19	48.07	96.15	480.75
122	76	-0.19	48.07	96.15	480.75
123	76	-0.19	48.07	96.15	480.75
124	76	-0.19	48.07	96.15	480.75
125	75	-0.26	47.41	94.82	474.11
126	75	-0.26	47.41	94.82	474.11
127	75	-0.26	47.41	94.82	474.11
128	75	-0.26	47.41	94.82	474.11
129	75	-0.26	47.41	94.82	474.11
130	75	-0.26	47.41	94.82	474.11
131	75	-0.26	47.41	94.82	474.11
132	74	-0.33	46.75	93.49	467.47
133	74	-0.33	46.75	93.49	467.47
134	74	-0.33	46.75	93.49	467.47
135	74	-0.33	46.75	93.49	467.47
136	74	-0.33	46.75	93.49	467.47
137	74	-0.33	46.75	93.49	467.47
138	73	-0.39	46.08	92.17	460.83
139	72	-0.46	45.42	90.84	454.19
140	72	-0.46	45.42	90.84	454.19
141	72	-0.46	45.42	90.84	454.19

S. No	Marks	Z-score	T-score	AGCT-score	CEEB-score
142	72	-0.46	45.42	90.84	454.19
143	72	-0.46	45.42	90.84	454.19
144	71	-0.52	44.76	89.51	447.55
145	71	-0.52	44.76	89.51	447.55
146	71	-0.52	44.76	89.51	447.55
147	71	-0.52	44.76	89.51	447.55
148	71	-0.52	44.76	89.51	447.55
149	71	-0.52	44.76	89.51	447.55
150	70	-0.59	44.09	88.18	440.92
151	70	-0.59	44.09	88.18	440.92
152	70	-0.59	44.09	88.18	440.92
153	70	-0.59	44.09	88.18	440.92
154	70	-0.59	44.09	88.18	440.92
155	70	-0.59	44.09	88.18	440.92
156	69	-0.66	43.43	86.86	434.28
157	69	-0.66	43.43	86.86	434.28
158	69	-0.66	43.43	86.86	434.28
159	69	-0.66	43.43	86.86	434.28
160	68	-0.72	42.76	85.53	427.64
161	68	-0.72	42.76	85.53	427.64
162	68	-0.72	42.76	85.53	427.64
163	68	-0.72	42.76	85.53	427.64
164	68	-0.72	42.76	85.53	427.64
165	68	-0.72	42.76	85.53	427.64
166	67	-0.79	42.10	84.20	421.00
167	67	-0.79	42.10	84.20	421.00
168	67	-0.79	42.10	84.20	421.00
169	67	-0.79	42.10	84.20	421.00
170	67	-0.79	42.10	84.20	421.00
171	66	-0.86	41.44	82.87	414.36
172	66	-0.86	41.44	82.87	414.36
173	66	-0.86	41.44	82.87	414.36
174	66	-0.86	41.44	82.87	414.36
175	66	-0.86	41.44	82.87	414.36
176	66	-0.86	41.44	82.87	414.36
177	66	-0.86	41.44	82.87	414.36
178	66	-0.86	41.44	82.87	414.36
179	65	-0.92	40.77	81.54	407.72
180	65	-0.92	40.77	81.54	407.72
181	65	-0.92	40.77	81.54	407.72
182	65	-0.92	40.77	81.54	407.72
183	65	-0.92	40.77	81.54	407.72
184	64	-0.99	40.11	80.22	401.09
185	64	-0.99	40.11	80.22	401.09
186	64	-0.99	40.11	80.22	401.09
187	64	-0.99	40.11	80.22	401.09
188	63	-1.06	39.44	78.89	394.45
189	63	-1.06	39.44	78.89	394.45
190	63	-1.06	39.44	78.89	394.45
191	62	-1.12	38.78	77.56	387.81

S. No	Marks	Z-score	T-score	AGCT-score	CEEB-score
192	61	-1.19	38.12	76.23	381.17
193	61	-1.19	38.12	76.23	381.17
194	61	-1.19	38.12	76.23	381.17
195	60	-1.25	37.45	74.91	374.53
196	60	-1.25	37.45	74.91	374.53
197	60	-1.25	37.45	74.91	374.53
198	60	-1.25	37.45	74.91	374.53
199	59	-1.32	36.79	73.58	367.89
200	59	-1.32	36.79	73.58	367.89
201	59	-1.32	36.79	73.58	367.89
202	58	-1.39	36.13	72.25	361.26
203	58	-1.39	36.13	72.25	361.26
204	57	-1.45	35.46	70.92	354.62
205	56	-1.52	34.80	69.60	347.98
206	56	-1.52	34.80	69.60	347.98
207	55	-1.59	34.13	68.27	341.34
208	55	-1.59	34.13	68.27	341.34
209	54	-1.65	33.47	66.94	334.70
210	54	-1.65	33.47	66.94	334.70
211	53	-1.72	32.81	65.61	328.06
212	53	-1.72	32.81	65.61	328.06
213	53	-1.72	32.81	65.61	328.06
214	53	-1.72	32.81	65.61	328.06
215	51	-1.85	31.48	62.96	314.79
216	51	-1.85	31.48	62.96	314.79
217	51	-1.85	31.48	62.96	314.79
218	51	-1.85	31.48	62.96	314.79
219	50	-1.92	30.81	61.63	308.15
220	46	-2.18	28.16	56.32	281.59
221	46	-2.18	28.16	56.32	281.59

+ Output from computer



```

0044      IF (T(I),1),&Q,M)GOTO 0
0045      CM(I,1)=0.
0046      GOTO 1
0047      H      CM(I,1)=1.
0048      GO TO 7
0049      Q      CM(I,1)=2.
0050      7      CONTINUE
0051      DO 10 I=1,N
0052      DO 10 J=1,M
0053      IF (CM(I,1),FO,2,1)GOTO 10
0054      OT(1)=OT(1)+CM(I,1)
0055      10      CONTINUE
0056      DO 11 I=1,N
0057      DO 12 J=1,M,2
0058      IF (CM(I,1),FM,2,1)GOTO 12
0059      OT(1)=OT(1)+CM(I,1)
0060      12      CONTINUE
0061      11      FT(1)=OT(1)-OT(1)
0062      L=H/2
0063      DO 13 I=1,N
0064      DO 14 J=1,L
0065      IF (CM(I,1),FO,2,1)GOTO 14
0066      FH(1)=FH(1)+CM(I,1)
0067      14      CONTINUE
0068      13      AH(I)=OT(1)-FH(1)
0069      DO 15 I=1,N
0070      DO 16 J=1,L
0071      K=IDAN(I)
0072      IF (CM(I,K),FO,2,1)GOTO 16
0073      RH(1)=RH(1)+CM(I,K)
0074      16      CONTINUE
0075      WH(I)=OT(1)-RH(1)
0076      PRINT*,Q0
0077      PRINT*,Q122
0078      50122      FORMAT(2Y,'X,N0','2X,'D16.4','D16.4','TOTAL',5X,'D16.4','D16.4',F4,1F4)
0079      50122      IT=SFCONV('X','DANPCW=H&I',//)
0080      50121      PRINT*,Q011,H,      OT(1),OT(1),FT(1),FH(1),AH(1),WH(1),WH(1)
0081      5011      FORMAT(2Y,'15,10X,1Y,F5.1,3F20.2Y,F4.0,1Y,1)
0082      CALL FOR(FM,N,AM,AK2,VF,VH,VDP)
0083      CALL FOR(OT,N,OT,AK1,VF,VH,VDP)
0084      CALL FOR(OT,N,ET,AK1,VH,VF,VH)
0085      CALL FOR(DH,N,DH1,AK3,VH,VH,VH,VH)
0086      J=1
0087      J=1
0088      SMA=OT(1)
0089      RIC=OT(1)
0090      D1=0001102,N
0091      IF (OT(1),OT,HTG)GOTO 0002
0092      IF (OT(1),LT,SMA)GOTO 0003
0093      GOTO 0004
0094      0002      RT=RT(1)
0095      J=1
0096      GOTO 0004
0097      0004      SMA=OT(1)
0098      J=1
0099      0001      CONTINUE
0100      J=J+JTM

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0101      SMOBWA
0102      MURBWA(10)
0103      MURBWA(10)
0104      MURBWA(10)
0105      MURBWA(10)
0106      MURBWA(10)
0107      MURBWA(10)
0108      MURBWA(10)
0109      MURBWA(10)
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0113      MURBWA(10)
0114      MURBWA(10)
0115      MURBWA(10)
0116      MURBWA(10)
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0122      MURBWA(10)
0123      MURBWA(10)
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0126      MURBWA(10)
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0154      MURBWA(10)
0155      MURBWA(10)
0156      MURBWA(10)
0157      MURBWA(10)

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0259      PRINTA0,S#1,S#2,S#3
0260      PRINT1
0261      71      FORMAT(5X,'S. DULDN FORMULA OF RELIABILITY',/)
0262      PRINTA0,M#1,M#5,M#0
0263      PRINT2
0264      72      FORMAT(5X,'S. FLANKANS FORMULA OF RELIABILITY',/)
0265      PRINTA0,F#0,FFS,F#0
0266      PRINT#00
0267      A#=(AK#*SDT(VT)-SDT(V0))/SDT(VT-V0-2.*AK#*SDT(VT-V0))
0268      PRINT135,A#0
0269      730      FORMAT(//,5X,' RELIABILITY HY MITSFN SHCOT CHT MTHOD1,F#0)
C      INTERNAL CONSISTENCY RELIABILITY ESTIMATES
0270      S#0=.
0271      S#0=.
0272      L1=AN*27./100.
0273      AAL#L1
0274      D080J#1,M
0275      #027(J)#0.
0276      C#27(J)#0.
0277      D0811#1,L1
0278      IF(C#1(J),FQ,1,1)GOTO#2
0279      IF(C#1(J),FQ,2,1)GOTO#11
0280      #027(J)=#027(J)+1.
0281      GOTO#11
0282      #2      C#27(J)=C#27(J)+1.
0283      #11      IF(C#1(J),FQ,1)GOTO#112
0284      GOTO#11
0285      #1112      #027(J)=C#27(J)+1
0286      S#045=#RT(T)
0287      #1      COUNT#4#E
0288      I72#4#L1*1
0289      D0811#177,4
0290      IF(C#1(J),FQ,1,1)GOTO#4
0291      IF(C#1(J),FQ,2,1)GOTO#4#0
0292      A#027(J)=A#027(J)+1.
0293      GOTO#4#0
0294      #4      A#027(J)=A#027(J)+1.
0295      IF(C#1(J),FQ,1)GOTO#00#0
0296      GOTO#11
0297      #000#0      S#045=#RT(T)+#RT(T)
0298      S#045=#RT(T)
0299      #1      COUNT#4#E
0300      #0      STG#A#STG#A+(#N27(J)+#027(J))*C#27(J)+A#027(J)/(A#1+A#1)*#0
0301      A7#2.*AAL
0302      S#045/A2
0303      VAR#27#(A#0A7#045#045)/A2
0304      #027#A#0#(1.-712/VT)/(A#-1.)
0305      #027#A#0#(1.-STG#A/VAR#27)/(A#-1.)
0306      AKR#0#A#0#(A#0VT-A#E#0#(A#-A#E#0#)/(A#-1.)+A#0VT)
0307      S#0#0.
0308      S#0#0.
0309      S#0#0.
0310      S#0#0.
0311      S#0#0.
0312      D080J#1,M
0313      #0#0#0#0#0(J)/AN
0314      S#045+C#0(J)/AN
0315      S#045#(C#0(J)+#0R(J))/(AN+A#0)

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0316      RM=SQ*(CR(I)+CR(J))/(AM+AM)
0317      XP=SQ/AM
0318      XN=SQ/AM
0319      VARP=(SQ-AM*XP*XP)/AM
0320      TM=SQ*(VT-AM*XP*SQ+AM*VARP)/(VT*(AM-1.))
0321      KR21=AM*(VT-AM*XP*SQ)/(AM-1.)*VT
0322      COEFFRM=(VT-KR21)/(AM-1.)*VT
0323      C
0324      QUESTION ANALYSIS TABLE
0325      S=RM,
0326      D=SQ*1.1, M
0327      D=SQ*1.1, N
0328      IF(CM(I,1).EQ.2.1)GOTO97
0329      C(J)=C(J)+1.
0330      IF(CM(I,1).EQ.1.1)AI(J)=AI(J)+RT(I)
0331      CONTINUE
0332      CT(I)=C(J)+100./AM
0333      AT(I)=AT(I)/C(J)
0334      FT(I)=C(R27(I)+ACR27(I))/(2.*AI)
0335      OT(I)=C(R27(I)+ACR27(I))/AAL
0336      SW=SQ*DT(I)+SQRT(VVAR(J))
0337      SUD=SQ*DT(I)
0338      SFF=SQ*FT(I)/100.
0339      SFF=SQ*FT(I)/(1000.
0340      CONTINUE
0341      ACOFF=AM*(1.-SQ/(SQ+SM))/(AM-1.)
0342      KATR=AM*(1.-M*(SFF-SFF2)/SUD)/(AM-1.)
0343      ATMF=1.-M*(1+AM)/VT
0344      PRINT100,KR20,KR27,AKR20,KR21,COFF,ACOFF,RATR,ATMF
0345      FORMAT(////,5X,'REFLECTIVITY BY W-20 FORMULA',12X,F10.4,/,5X,'KR-1
100  FOR FORM. RATED ON 27X MAG AND 27X LAG',2X,F10.4,/,5X,'ANOTHER FORM
2 OF W-20 FORM.',15X,F10.4,/,5X,'REFLECTIVITY W-21 FROM',12X,F10
1,4,/,5X,'CORRECTION COEFF ALPHA',20X,F10.4,/,5X,'LOWER BOUND ESTIMATE
OF OF EXAM REFLECTIVITY',10X,F10.4,/,5X,'STANLEY APPROXIMATION ',22X
5,F10.4,/,5X,'INDEX OF MEASUREMENT DEFICIENCY',F25.4,////)
0346      PRINTAN66,SAV,TKKH
0347      A6660 FORMAT(5X,'REFLECTIVITY BY ANALYSIS OF VAW.',2X,F15.4,/,5X,'TUCKER
1 MODIFIED K-R FROM',2X,F15.4,////)
0348      PRINTA00
0349      PRINTN50
0350      PRINT101
0351      FORMAT(//,15X,'QUESTION ANALYSIS TABLE',///)
0352      PRINTA00
0353      PRINT102
0354      FORMAT(1X,'ON. NO',2X,'TESTING',2X,'MEAN ANTLITY',2X,'FACILITY'
1,2X,'DISCRIMINATION',2X,'VARIANCE',/1X,'NO',2X,'QUESTION',6X,'INDEX'
2,/)
0355      PRINTA00
0356      PRINTN31,M
0357      PRINT108,1,C(I),A(I),F(I),D(I),VVAR(J)
0358      FORMAT(14,F12.4,2F12.4,2X,2F15.4)
0359      PRINTA00
0360      PRINTN50
0361      PRINT109
0362      FORMAT(25X,'DERIVED SCORE TABLE',///)
0363      PRINTA00
0364      FORMAT(///,2X,'S.NO.',2X,'MARKS',2X,'ZSCORE',2X,'T-SCORE',2X,'AGG
11-Score',2X,'CEFB-Score',////)

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[illegible]

[illegible]

[illegible]



[illegible]

[illegible]



[illegible]

212 A C C E D A H A A D Q C R H D A H C A R A C H D D D H C A D A C A A C F R D C A D D D D D D R A N H D C  
 D D Q R R D H A R A D Q C R H D A H C A R A C H D D D H C A D A C A A C F R D C A D D D D D D R A N H D C  
 F I F F T T F T F F T T F T F T T T T T F T F F C E A A A E D H R C A E A A A D E C A A A A A A  
 213 9 C H A C C R D H C A D H C A D H A D D A C D Q R A C H R C D C H R C A D H C A C A C D D D A R A H A D  
 H C H A C C R D H C A D H C A D H A D D A C D Q R A C H R C D C H R C A D H C A C A C D D D A R A H A D  
 T F F T F T F F T F F T F T T T F F T F T T C C E D C A C E L C C A E H D H C E C E D R E C C H H A  
 214 H C D A R C H A C D H A D A A C A C A C D D A H C C C H C C C A A D D D A H D A A C A D D  
 A C B R D C D D D C D A C A R D A A A A D C A A C T F T - - - T T F T F F - T - - - T F T T F T F  
 T T - F T T - F T F F - - - T - - T - F C E F H A A C F A A H D D C C R F - H - D E A A F E C A  
 215 R A C D H D H C A C A C A H D C A H D C C C D D A C C D H C H D C D D C D A A H R H A C H A D D  
 D A H A R C R D C A D A A H D D H D A D D C C - T T T T C F - - F T F T - T F - T - -  
 T F F - T T F T - C T F F - - T - - T F T C F F C A C C C C E C C - E C C C C D E A F C R  
 216 H D C D D C H D A H A R D A A C C A H D H D A C H C C A C A D C D D H D A H C C C A R C H A D D  
 A A H H C D D D A A H D H C D D D H D H D C C - - - T F T F F - - - T - T T T F T - - -  
 T - - - - - T - - F - T F - - - - - T A A F R A A H F E C C C A H C C R C D H C D H F C U  
 217 H C R D R D H C H C A H A A C A D A D D D D H C C H C A D C D A B R H A H A A D D  
 D A H A C H C A C H H C C D A A D H D D C C F T F F T T F A T F T F T F T F T T F T T  
 T F F T T T F T F T F A T F T T F T F A C H F C C C E A C A F D A A E H A A C C H C A A  
 218 H D A C C H D A A A A C H D A C A C A H D D A C B C D H C A F H S H D D H H H H H A D D  
 A A A R C H D A C R D H C D A A D H A C C D D F T T F T T F F F F F T F T T - F F T T  
 T F - T T T F F F F F T - - F T F T T A H F A F A A A R A A E R H D C A C C C A  
 219 A C D C H D A C D C A D A C C C A C A C D D A H C C D H C R C H D C A A A D C C H H H D H  
 T F F T T T T T F T F F F F T - - F T F T T A H F A F A A A R A A E R H D C A C C C A  
 220 T F F T T T T T F T F F F F T T F T T A C C C A C C A A A F F A A A C D C A D E F A E A  
 C D H C A D H D C C A H A A A C A C D D H C H D C H D C A D C D C H D A H A H A D D  
 A D H C D D A C A R H C A A A D H D A A D F T T T T F F T T T F T T T F T T F F  
 221 T F T T T T T T F T T T T F T T F F T T A A C C H C C C A R D H A C C D D C H H F L A  
 C D C D D D H C C A H D A C A C A A D D H C C C A D D A C C D C C A H A D D  
 A C H B H C R D C C H C C D D H D A D C C H F T T T T T T F T F T F T T F T T F T F  
 T F T T T T T F F Y F T T F T T T T F T A C A C A C C A C A F - H D A R D F F A C C A C

S. NO. ROLL NO TOTAL MARKS PERCENTAGE SAMPLE MARK

1	97	96	51	53	34	51	16
2	98	90	48	48	50	17	51
3	99	51	23	25	20	11	23
4	51	23	28	26	26	27	23
5	97	87	47	54	42	49	45
6	16	25	21	24	22	26	22
7	75	38	36	38	36	43	31
8	46	10	17	15	11	46	16
9	97	46	48	44	46	40	45
10	78	31	30	38	32	33	36
11	70	31	38	38	31	38	31
12	77	42	45	41	36	40	33
13	46	18	28	34	32	32	28
14	98	47	51	50	48	53	45
15	98	35	33	33	36	46	32
16	70	38	42	31	30	46	35
17	70	32	42	43	31	40	36
18	99	50	40	54	44	52	37
19	62	15	32	31	31	33	28
20	45	12	41	48	37	45	40
21	67	35	32	32	35	43	31
22	43	10	44	43	40	43	40
23	26	44	54	50	46	50	36
24	100	52	52	60	48	53	51
25	71	42	37	41	38	33	48
26	61	38	43	40	41	41	40
27	50	31	28	26	33	25	31
28	75	38	37	47	24	31	40
29	99	51	48	51	44	46	53
30	48	10	41	40	36	46	35
31	55	20	26	26	29	42	23
32	60	31	20	32	24	33	27
33	88	47	41	48	40	43	45
34	71	37	36	36	34	48	33
35	75	40	35	37	34	37	48
36	65	35	30	32	33	35	40
37	50	25	31	37	22	40	20
38	51	31	30	28	33	40	31
39	99	48	45	45	40	48	46
40	75	40	46	46	50	41	50
41	95	48	47	51	43	50	45
42	65	34	20	30	31	38	27
43	100	40	40	50	50	40	40
44	92	40	41	54	38	40	43
45	57	27	43	28	27	46	27
46	68	36	32	40	26	32	46
47	61	20	27	40	32	28	23
48	53	28	26	26	28	40	23
49	53	22	31	26	26	26	23
50	100	60	40	63	52	55	48
51	72	38	30	36	37	36	48
52	82	38	40	46	37	46	46
53	77	38	40	43	34	40	37
54	75	36	38	36	38	46	36
55	80	42	45	50	40	43	48
56	47	43	40	44	43	52	35
57	94	47	40	50	46	44	42
58	50	27	27	30	24	26	20
59	78	37	31	52	26	23	41
60	74	30	47	43	33	48	48
61	90	40	45	62	42	47	47
62	79	36	42	43	35	43	35
63	46	20	37	31	36	31	35
64	79	42	36	44	32	48	32
65	69	41	48	62	47	45	43

A6	A0	39	41	27	3A	17	43
A7	A7	39	0A	04	02	04	03
A8	0A	05	51	53	05	40	09
A9	05	04	00	04	06	0A	00
70	51	25	2A	23	2A	22	27
71	0A	3A	33	02	27	37	12
72	0A	33	33	3A	30	32	30
73	A0	30	0C	09	34	40	00
74	9A	00	0A	57	03	07	03
75	7A	37	10	30	37	02	30
76	A9	00	00	03	01	00	55
77	00	05	50	CA	05	50	00
78	10A	51	5C	A1	05	5A	50
79	79	30	10	05	27	37	3C
80	77	03	30	00	37	00	37
81	61	30	31	31	30	3E	2A
82	70	37	33	00	30	1A	32
83	75	35	00	20	34	00	3C
84	61	31	29	36	24	1C	2C
85	01	01	04	03	04	0A	03
86	A0	32	32	36	2A	02	02
87	8A	05	01	04	02	06	00
88	71	00	31	06	25	10	33
89	5A	20	27	2A	28	2A	2A
90	02	02	01	07	3A	03	00
01	72	3A	4A	05	27	30	33
02	7A	00	3A	00	3A	03	33
03	77	3A	50	0A	31	00	37
04	71	33	3A	3A	33	3A	3A
05	75	3A	30	30	3A	00	33
06	A8	35	33	33	35	35	33
07	60	33	27	27	33	31	20
08	A7	32	35	2A	30	35	32
09	7A	32	3A	37	33	3E	32
100	A7	30	30	3A	20	1A	2A
101	75	3A	37	30	3A	09	3A
102	10A	35	3C	CA	02	5C	3A
103	103	40	5A	CA	07	5C	0A
104	0A	02	52	3A	0A	01	5C
105	05	05	20	0A	03	04	05
106	0A	07	20	51	05	CA	0A
107	01	00	01	27	30	00	37
108	11	52	50	57	CA	5A	53
109	71	35	3A	30	32	30	37
110	A8	3A	30	00	2A	01	2A
111	50	30	2C	33	2A	33	2A
112	8A	00	0A	53	34	0A	00
113	70	01	3A	27	32	00	30
114	11A	51	50	CA	51	57	53
115	A5	05	00	03	01	05	10
116	A3	02	01	00	03	01	02
117	73	4A	35	20	33	36	3A
118	7C	3A	3C	01	34	37	30
119	8A	01	07	51	3A	07	01
120	7A	37	30	3A	00	00	37
121	AC	00	0C	0A	30	07	4A
122	10A	00	CA	CA	CA	53	CA
123	A7	00	07	05	32	40	03
124	5A	33	30	3A	20	31	37
125	72	30	3A	30	02	37	3A
126	AC	30	31	20	3A	3A	20
127	51	2C	2A	31	20	20	20
128	00	02	52	55	30	07	07
129	102	51	51	CA	0A	00	51
130	5A	20	37	30	27	30	27
131	8A	3A	00	22	3A	30	41
132	00	00	02	53	37	51	30
133	0C	0A	05	05	00	00	3A
134	5A	2A	2A	2A	30	2A	2A
135	05	0A	50	CA	0A	0A	CA
136	102	43	20	CA	0A	5C	07
137	100	3A	CA	CA	05	CA	07

138	82	39	43	47	55	41	41
139	60	31	29	40	20	33	27
140	77	40	37	42	38	38	39
141	54	28	25	38	19	28	25
142	63	35	28	22	41	32	41
143	58	27	31	37	21	20	20
144	87	43	40	47	40	46	41
145	46	46	50	51	45	47	49
146	76	39	37	49	27	42	38
147	80	41	48	42	47	46	45
148	66	35	31	38	32	38	42
149	88	43	45	49	39	45	33
150	45	30	35	47	18	39	26
151	95	48	47	53	42	51	49
152	56	28	38	29	37	29	37
153	51	29	32	28	33	36	28
154	68	35	33	29	30	33	35
155	87	48	41	48	39	49	38
156	74	32	42	40	30	36	38
157	90	50	40	52	47	50	49
158	78	39	30	45	33	47	41
159	92	48	47	53	39	50	48
160	104	51	55	63	46	52	50
161	86	43	43	45	41	49	37
162	60	28	36	32	32	33	31
163	88	43	43	47	3	41	45
164	101	51	50	66	45	50	47
165	98	47	52	68	33	48	51
166	76	36	30	45	30	49	36
167	77	43	38	38	39	42	35
168	100	47	53	64	48	53	47
169	88	49	39	60	38	49	44
170	79	40	39	49	39	49	38
171	106	49	56	69	48	53	42
172	72	35	37	38	34	40	32
173	96	49	47	48	48	52	49
174	77	37	40	45	32	38	29
175	99	47	52	52	42	48	43
176	46	51	43	50	44	46	49
177	91	41	50	53	40	50	33
178	78	39	30	39	39	38	38
179	103	52	51	68	48	58	45
180	68	36	33	32	38	39	29
181	68	38	38	38	30	35	33
182	71	35	36	40	33	39	32
183	48	23	22	22	24	24	20
184	53	23	18	28	24	28	25
185	69	36	30	39	30	35	33
186	49	34	35	33	38	35	39
187	93	44	48	51	45	51	43
188	88	45	43	38	40	38	40
189	106	48	58	68	53	53	45
190	75	35	40	38	37	39	36
191	60	20	35	39	25	33	31
192	79	38	36	42	32	40	39
193	92	48	48	45	47	48	49
194	42	39	43	43	39	33	43
195	76	36	40	38	38	39	47
196	67	37	40	39	28	32	25
197	95	48	47	47	48	48	47
198	70	35	35	42	28	39	33
199	81	49	43	49	32	45	46
200	53	21	20	21	29	24	27
201	86	41	45	42	44	48	38
202	67	30	33	33	30	39	33
203	87	42	45	51	38	45	42
204	85	43	42	50	35	45	49
205	87	48	41	50	37	49	38
206	68	28	37	36	29	33	42
207	58	39	28	30	28	29	29
208	66	33	33	27	34	36	39
209	70	35	35	38	32	37	33

210	100,	48,	54,	57,	07,	49,	54,
211	84,	42,	31,	02,	01,	44,	07,
212	45,	30,	26,	41,	20,	12,	24,
213	01,	00,	02,	07,	00,	06,	05,
214	03,	28,	45,	02,	21,	30,	11,
215	05,	00,	05,	50,	34,	04,	02,
216	20,	36,	34,	51,	23,	00,	10,
217	00,	03,	46,	51,	00,	50,	05,
218	42,	18,	30,	42,	30,	02,	00,
219	44,	30,	00,	01,	00,	01,	02,
220	00,	00,	46,	07,	03,	00,	50,
221	100,	00,	54,	46,	00,	40,	50,

1	46,00	2,00	2,00
2	50,00	1,00	3,00
3	51,00	0,00	3,00
4	51,00	0,00	11,00
5	50,00	2,00	11,00
6	55,00	2,00	15,00
7	55,00	2,00	17,00
8	55,00	1,00	18,00
9	58,00	2,00	20,00
10	50,00	1,00	21,00
11	40,00	0,00	27,00
12	41,00	1,00	30,00
13	42,00	1,00	31,00
14	43,00	3,00	31,00
15	40,00	0,00	35,00
16	45,00	5,00	43,00
17	46,00	4,00	51,00
18	47,00	2,00	52,00
19	48,00	0,00	51,00
20	49,00	0,00	65,00
21	70,00	6,00	71,00
22	71,00	0,00	77,00
23	72,00	0,00	80,00
24	73,00	1,00	83,00
25	74,00	0,00	80,00
26	75,00	0,00	97,00
27	76,00	0,00	103,00
28	77,00	0,00	110,00
29	78,00	0,00	116,00
30	70,00	2,00	130,00
31	80,00	2,00	120,00
32	81,00	3,00	121,00
33	82,00	0,00	127,00
34	83,00	5,00	132,00
35	80,00	3,00	136,00
36	85,00	0,00	141,00
37	86,00	5,00	146,00
38	87,00	0,00	150,00
39	88,00	0,00	160,00
40	80,00	0,00	160,00
41	90,00	3,00	167,00
42	91,00	2,00	168,00
43	92,00	1,00	172,00
44	90,00	7,00	170,00
45	95,00	0,00	181,00
46	96,00	0,00	180,00
47	97,00	1,00	180,00
48	98,00	3,00	191,00
49	90,00	7,00	200,00
50	100,00	0,00	200,00
51	101,00	1,00	200,00
52	102,00	2,00	207,00
53	103,00	3,00	210,00
54	100,00	3,00	214,00
55	105,00	1,00	210,00
56	106,00	0,00	214,00
57	107,00	2,00	220,00
58	111,00	1,00	221,00

## ANALYSIS OF VARIANCE TABLE

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEANS SQUARES	VARIANCE RATIO
EXPERIMENTAL	SS, GRAM	DOF,	MS, GRAM	F, 99%
TEMP	1710.1523	109.	15.684	60.4522
REMAINING	6217.0105	1270.	0.1497	

# RELIABILITY OF THE TEST

## 1. SPLIT HALF RELIABILITY

ORD-LEVEL SPLIT	0.8089
RANDOM HALF SPLIT	0.5822
START-SECTION HALF	0.7778

## 2. REPEATED MEASURES TEST RELIABILITY

ORD-LEVEL SPLIT	0.8020
RANDOM HALF SPLIT	0.7281
START-SECTION HALF	0.8745

## 3. KRONECKER RHO RELIABILITY

ORD-LEVEL SPLIT	0.8007
RANDOM HALF SPLIT	0.7281
START-SECTION HALF	0.8740

## 4. FLEISSNER FORMULA OF RELIABILITY

ORD-LEVEL SPLIT	0.8007
RANDOM HALF SPLIT	0.7281
START-SECTION HALF	0.8740

RELIABILITY BY MULTIPLE CORRELATION METHOD 0.8089

RELIABILITY BY KR-20 FORMULA	0.8700
KR-20 FORM. BASED ON 27X 48R AND 27X 12R	0.9282
ENTIRE FORM. BASED ON 27X 48R	0.8089
RELIABILITY BY KR-21 FORM.	0.8089
FORMULARK DIFF ALPHAS	0.8700
LOWER BOUND ESTIMATE OF EVAN RELIABILITY	0.9078
STANLEY APPROXIMATION	0.8089
THEORY OF MEASUREMENT EFFICIENCY	0.8089

RELIABILITY BY ANALYSIS OF VAR. 0.8720

TURKEY MODIFIED KR-0 FORM. 0.8720

### QUESTIONS ANALYSIS TABLE

NO.	NO. QUESTIONS	MEAN ABILITY	FACTILITY	DISCRIMINATION	VARIANCE
1	1	1.00	1.00	1.00	1.00
2	2	1.00	1.00	1.00	1.00
3	3	1.00	1.00	1.00	1.00
4	4	1.00	1.00	1.00	1.00
5	5	1.00	1.00	1.00	1.00
6	6	1.00	1.00	1.00	1.00
7	7	1.00	1.00	1.00	1.00
8	8	1.00	1.00	1.00	1.00
9	9	1.00	1.00	1.00	1.00
10	10	1.00	1.00	1.00	1.00
11	11	1.00	1.00	1.00	1.00
12	12	1.00	1.00	1.00	1.00
13	13	1.00	1.00	1.00	1.00
14	14	1.00	1.00	1.00	1.00
15	15	1.00	1.00	1.00	1.00
16	16	1.00	1.00	1.00	1.00
17	17	1.00	1.00	1.00	1.00
18	18	1.00	1.00	1.00	1.00
19	19	1.00	1.00	1.00	1.00
20	20	1.00	1.00	1.00	1.00
21	21	1.00	1.00	1.00	1.00
22	22	1.00	1.00	1.00	1.00
23	23	1.00	1.00	1.00	1.00
24	24	1.00	1.00	1.00	1.00
25	25	1.00	1.00	1.00	1.00
26	26	1.00	1.00	1.00	1.00
27	27	1.00	1.00	1.00	1.00
28	28	1.00	1.00	1.00	1.00
29	29	1.00	1.00	1.00	1.00
30	30	1.00	1.00	1.00	1.00
31	31	1.00	1.00	1.00	1.00
32	32	1.00	1.00	1.00	1.00
33	33	1.00	1.00	1.00	1.00
34	34	1.00	1.00	1.00	1.00
35	35	1.00	1.00	1.00	1.00
36	36	1.00	1.00	1.00	1.00
37	37	1.00	1.00	1.00	1.00
38	38	1.00	1.00	1.00	1.00
39	39	1.00	1.00	1.00	1.00
40	40	1.00	1.00	1.00	1.00
41	41	1.00	1.00	1.00	1.00
42	42	1.00	1.00	1.00	1.00
43	43	1.00	1.00	1.00	1.00
44	44	1.00	1.00	1.00	1.00
45	45	1.00	1.00	1.00	1.00
46	46	1.00	1.00	1.00	1.00
47	47	1.00	1.00	1.00	1.00
48	48	1.00	1.00	1.00	1.00
49	49	1.00	1.00	1.00	1.00
50	50	1.00	1.00	1.00	1.00
51	51	1.00	1.00	1.00	1.00
52	52	1.00	1.00	1.00	1.00
53	53	1.00	1.00	1.00	1.00
54	54	1.00	1.00	1.00	1.00
55	55	1.00	1.00	1.00	1.00
56	56	1.00	1.00	1.00	1.00
57	57	1.00	1.00	1.00	1.00
58	58	1.00	1.00	1.00	1.00
59	59	1.00	1.00	1.00	1.00
60	60	1.00	1.00	1.00	1.00
61	61	1.00	1.00	1.00	1.00
62	62	1.00	1.00	1.00	1.00
63	63	1.00	1.00	1.00	1.00
64	64	1.00	1.00	1.00	1.00
6					

1	100,0000	34,6518	0,4920	0,201300	0,200135
2	100,0000	31,1288	0,4076	0,200766	0,200403
3	100,0000	26,7704	0,3403	0,200403	0,200135
4	100,0000	20,8507	0,2734	0,201186	0,200403
5	100,0000	18,5113	0,2841	0,200100	0,200403
6	100,0000	17,2456	0,2876	0,200208	0,200403
7	100,0000	15,1034	0,2820	0,200767	0,200135
8	100,0000	13,2400	0,2734	0,200403	0,200135
9	100,0000	10,0517	0,2420	0,200100	0,200135
10	100,0000	8,2070	0,2208	0,200100	0,200135
11	100,0000	6,7163	0,2076	0,200100	0,200135
12	100,0000	5,4320	0,2006	0,200766	0,200135
13	100,0000	4,3100	0,1920	0,200766	0,200135
14	100,0000	3,3500	0,1816	0,200100	0,200403
15	100,0000	2,5710	0,1670	0,200100	0,200403
16	100,0000	1,9310	0,1501	0,200100	0,200403
17	100,0000	1,4740	0,1395	0,200766	0,200135
18	100,0000	1,1511	0,1250	0,200766	0,200135
19	100,0000	0,9173	0,1172	0,200100	0,200403
20	100,0000	0,7273	0,1083	0,200100	0,200403
21	100,0000	0,5710	0,1000	0,200100	0,200403
22	100,0000	0,4500	0,0920	0,200100	0,200403
23	100,0000	0,3500	0,0850	0,200100	0,200403
24	100,0000	0,2700	0,0790	0,200100	0,200403
25	100,0000	0,2000	0,0740	0,200100	0,200403
26	100,0000	0,1400	0,0690	0,200100	0,200403
27	100,0000	0,1000	0,0650	0,200100	0,200403
28	100,0000	0,0700	0,0610	0,200100	0,200403
29	100,0000	0,0500	0,0570	0,200100	0,200403
30	100,0000	0,0300	0,0540	0,200100	0,200403
31	100,0000	0,0200	0,0510	0,200100	0,200403
32	100,0000	0,0100	0,0480	0,200100	0,200403
33	100,0000	0,0050	0,0450	0,200100	0,200403
34	100,0000	0,0020	0,0420	0,200100	0,200403
35	100,0000	0,0010	0,0390	0,200100	0,200403
36	100,0000	0,0005	0,0360	0,200100	0,200403
37	100,0000	0,0002	0,0330	0,200100	0,200403
38	100,0000	0,0001	0,0300	0,200100	0,200403
39	100,0000	0,0000	0,0270	0,200100	0,200403
40	100,0000	0,0000	0,0240	0,200100	0,200403
41	100,0000	0,0000	0,0210	0,200100	0,200403
42	100,0000	0,0000	0,0180	0,200100	0,200403
43	100,0000	0,0000	0,0150	0,200100	0,200403
44	100,0000	0,0000	0,0120	0,200100	0,200403
45	100,0000	0,0000	0,0090	0,200100	0,200403
46	100,0000	0,0000	0,0060	0,200100	0,200403
47	100,0000	0,0000	0,0030	0,200100	0,200403
48	100,0000	0,0000	0,0000	0,200100	0,200403
49	100,0000	0,0000	0,0000	0,200100	0,200403
50	100,0000	0,0000	0,0000	0,200100	0,200403
51	100,0000	0,0000	0,0000	0,200100	0,200403
52	100,0000	0,0000	0,0000	0,200100	0,200403
53	100,0000	0,0000	0,0000	0,200100	0,200403
54	100,0000	0,0000	0,0000	0,200100	0,200403
55	100,0000	0,0000	0,0000	0,200100	0,200403
56	100,0000	0,0000	0,0000	0,200100	0,200403

57	100,0000	70,0050	0,8475	0,155001	0,100124
58	100,0000	87,1367	0,5478	0,427110	0,206801
59	100,0000	34,1602	0,5264	0,109081	0,200872
60	100,0000	46,8823	0,7712	0,300830	0,108234
61	100,0000	82,2805	0,4015	0,330835	0,200872
62	100,0000	45,7330	0,7707	0,203100	0,108234
63	100,0000	50,1122	0,6102	0,870576	0,200801
64	100,0000	36,1071	0,5479	0,109081	0,200872
65	100,0000	21,0633	0,2208	0,000007	0,107785
66	100,0000	59,8869	0,7861	0,322034	0,104494
67	100,0000	20,4440	0,3418	0,380830	0,204430
68	100,0000	14,8014	0,2208	-0,0104000	0,155028
69	100,0000	40,2605	0,6625	0,427110	0,201850
70	100,0000	19,0560	0,2081	0,305084	0,173515
71	100,0000	41,0810	0,7208	0,508875	0,104494
72	100,0000	50,4388	0,5763	0,574271	0,200835
73	100,0000	51,4704	0,5032	0,008780	0,235422
74	100,0000	38,8507	0,3480	0,001525	0,221208
75	100,0000	45,1021	0,6271	0,155001	0,222221
76	100,0000	86,8805	0,5763	0,203100	0,223730
77	100,0000	34,8733	0,3075	-0,050827	0,221208
78	100,0000	36,2670	0,4122	-0,0104000	0,208152
79	100,0000	24,0728	0,3480	-0,152562	0,214652
80	100,0000	44,0543	0,8851	0,322034	0,107801
81	100,0000	45,7105	0,7881	0,027720	0,150054
82	100,0000	70,8100	0,0153	0,155001	0,100124
83	100,0000	27,0007	0,3720	0,237284	0,214652
84	100,0000	86,8228	0,6220	0,208136	0,108234
85	100,0000	34,1602	0,5274	0,109080	0,205405
86	100,0000	23,0480	0,3720	0,133008	0,200055
87	100,0000	45,1021	0,7707	0,155001	0,151103
88	100,0000	40,1575	0,7208	0,372081	0,104494
89	100,0000	40,0501	0,6860	0,380830	0,191307
90	100,0000	72,2080	0,8812	0,203100	0,200818
91	100,0000	42,4704	0,7201	0,027720	0,182106
92	100,0000	4,8100	0,0743	-0,152562	0,067157
93	100,0000	1,0000	0,0503	-0,0104000	0,030066
94	100,0000	78,4570	0,0831	0,033008	0,088028
95	100,0000	72,2080	0,8850	0,223130	0,060418
96	100,0000	70,0012	0,9704	-0,0104000	0,053706
97	100,0000	72,3313	0,0868	0,188881	0,080618
98	100,0000	51,0728	0,6354	0,144881	0,233360
99	100,0000	59,0050	0,7208	0,018095	0,180185
100	100,0000	31,8010	0,3810	0,550122	0,210053
101	100,0000	70,0021	0,8808	0,188881	0,103806
102	100,0000	86,8208	0,5032	0,574271	0,205081
103	100,0000	87,7084	0,5503	0,305085	0,202093
104	100,0000	57,6048	0,6848	0,208136	0,205720
105	100,0000	17,5200	0,2502	0,0	0,172660
106	100,0000	73,5200	0,0576	0,050887	0,061553
107	100,0000	50,1470	0,5887	0,525030	0,200136
108	100,0000	33,4100	0,0153	0,142582	0,202215
109	100,0000	0,3328	0,0887	-0,135503	0,050335
110	100,0000	42,0501	0,7881	0,380830	0,177518
111	100,0000	12,3088	0,1860	0,067707	0,127528
112	100,0000	47,8507	0,5887	0,208136	0,203330
113	100,0000	38,1024	0,6354	0,188880	0,208136
114	100,0000	30,4552	0,4330	-0,088786	0,200050
115	100,0000	40,0433	0,8875	0,271186	0,123130
116	100,0000	50,2751	0,6017	0,001525	0,208435
117	100,0000	02,4025	0,5254	0,008780	0,200872
118	100,0000	52,8478	0,6860	0,223130	0,208136
119	100,0000	33,3037	0,4831	0,050887	0,202093
120	100,0000	13,1084	0,1081	0,188881	0,130177
121	100,0000	27,6548	0,3300	0,271186	0,221208
122	100,0000	34,0500	0,5032	0,208136	0,200872
123	100,0000	40,1267	0,7707	0,168001	0,100054
124	100,0000	04,4298	0,6017	0,250237	0,207783
125	100,0000	32,2880	0,3083	0,322034	0,236884
126	100,0000	10,1845	0,2208	0,208136	0,172540
127	100,0000	23,2805	0,1228	0,008780	0,104647
998	100,0000	27,4027	0,3334	0,380830	0,218116

129	100,0000	33,6190	0,0007	0,101695	0,202093
130	100,0000	37,7198	0,5169	0,118601	0,208838
131	100,0000	20,1375	0,2903	0,033804	0,180145
132	100,0000	36,0633	0,3903	0,021739	0,210026
133	100,0000	33,5468	0,3729	0,203500	0,201136
134	100,0000	10,1086	0,1346	0,033804	0,105329
135	100,0000	15,0000	0,1695	0,135403	0,108234
136	100,0000	30,5080	0,1410	0,118601	0,130301
137	100,0000	02,5466	0,0068	0,172801	0,220608
138	100,0000	20,0000	0,0015	0,070576	0,200000
139	100,0000	20,0000	0,2707	0,322034	0,207612
140	100,0000	16,0231	0,2373	0,155403	0,162140
141	100,0000	32,0638	0,0153	0,322034	0,217710
142	100,0000	33,0772	0,1810	0,220034	0,210034
143	100,0000	30,5075	0,1808	0,006780	0,200034
144	100,0000	26,0077	0,1051	0,372881	0,211357
145	100,0000	33,0050	0,0237	0,006780	0,200034
146	100,0000	12,2217	0,1610	0,118601	0,127020
147	100,0000	20,3308	0,3220	0,100001	0,150420
148	100,0000	21,8571	0,2712	0,271186	0,180145
149	100,0000	25,8105	0,3305	0,200237	0,213018
150	100,0000	11,0063	0,1800	0,203500	0,110003

DERIVED SCORE TABLE

S.NO. MARKS ZSCORE T-SCORE AGPT-SCORE REFB-SCORE

1	111.	2.13	71.41	142.62	714.12
2	110.	2.06	70.65	141.20	706.87
3	110.	2.06	70.65	141.20	706.87
4	104.	1.80	67.00	135.98	670.88
5	104.	1.80	67.00	135.98	670.88
6	104.	1.80	67.00	135.98	670.88
7	104.	1.80	67.00	135.98	670.88
8	105.	1.73	67.12	134.65	671.24
9	104.	1.67	66.66	133.32	666.89
10	104.	1.67	66.66	133.32	666.89
11	104.	1.67	66.66	133.32	666.89
12	104.	1.60	65.00	131.00	650.00
13	104.	1.60	65.00	131.00	650.00
14	104.	1.60	65.00	131.00	650.00
15	102.	1.53	65.33	130.46	653.10
16	102.	1.43	65.33	130.46	653.10
17	101.	1.37	64.66	129.33	646.45
18	100.	1.30	64.00	128.00	640.00
19	100.	1.20	64.00	128.00	640.00
20	100.	1.20	64.00	128.00	640.00
21	100.	1.20	64.00	128.00	640.00
22	99.	1.33	63.34	126.67	633.36
23	99.	1.33	63.34	126.67	633.36
24	99.	1.33	63.34	126.67	633.36
25	99.	1.33	63.34	126.67	633.36
26	99.	1.33	63.34	126.67	633.36
27	99.	1.33	63.34	126.67	633.36
28	99.	1.33	63.34	126.67	633.36
29	98.	1.27	62.67	125.34	626.71
30	98.	1.27	62.67	125.34	626.71
31	98.	1.27	62.67	125.34	626.71
32	97.	1.20	62.01	124.01	620.06
33	96.	1.13	61.34	122.68	613.42
34	96.	1.13	61.34	122.68	613.42
35	96.	1.13	61.34	122.68	613.42
36	96.	1.13	61.34	122.68	613.42
37	96.	1.13	61.34	122.68	613.42
38	96.	1.13	61.34	122.68	613.42
39	94.	1.07	60.68	121.35	606.77
40	94.	1.07	60.68	121.35	606.77
41	94.	1.07	60.68	121.35	606.77
42	94.	1.07	60.68	121.35	606.77
43	94.	1.00	60.01	120.02	600.12
44	94.	1.00	60.01	120.02	600.12
45	94.	1.00	60.01	120.02	600.12
46	94.	1.00	60.01	120.02	600.12
47	94.	1.00	60.01	120.02	600.12
48	94.	1.00	60.01	120.02	600.12
49	94.	1.00	60.01	120.02	600.12
50	92.	0.87	58.68	117.37	586.83
51	92.	0.87	58.68	117.37	586.83
52	92.	0.87	58.68	117.37	586.83
53	91.	0.80	58.02	116.04	580.18
ORR	91.	0.80	58.02	116.04	580.18

45	90.	^,74	57,35	114,71	573,53
46	90.	^,74	57,35	114,71	573,53
47	90.	^,74	57,35	114,71	573,53
48	80.	^,47	54,49	113,38	564,40
49	80.	^,47	54,49	113,38	564,40
50	80.	^,47	54,49	113,38	564,40
51	80.	^,47	54,49	113,38	564,40
52	80.	^,40	54,02	112,05	560,24
53	80.	^,40	54,02	112,05	560,24
54	80.	^,40	54,02	112,05	560,24
55	80.	^,40	54,02	112,05	560,24
56	80.	^,40	54,02	112,05	560,24
57	80.	^,40	54,02	112,05	560,24
58	87.	^,54	55,36	116,72	553,50
59	87.	^,54	55,36	116,72	553,50
70	87.	^,54	55,36	116,72	553,50
71	87.	^,54	55,36	116,72	553,50
72	87.	^,54	55,36	116,72	553,50
73	87.	^,54	55,36	116,72	553,50
74	87.	^,54	55,36	116,72	553,50
75	87.	^,54	55,36	116,72	553,50
76	84.	^,07	50,40	100,30	504,05
77	84.	^,07	50,40	100,30	504,05
78	84.	^,07	50,40	100,30	504,05
79	84.	^,07	50,40	100,30	504,05
80	84.	^,07	50,40	100,30	504,05
81	84.	^,07	50,40	100,30	504,05
82	84.	^,07	50,40	100,30	504,05
83	84.	^,07	50,40	100,30	504,05
84	84.	^,07	50,40	100,30	504,05
85	84.	^,07	50,40	100,30	504,05
86	84.	^,07	50,40	100,30	504,05
87	84.	^,07	50,40	100,30	504,05
88	84.	^,07	50,40	100,30	504,05
89	84.	^,07	50,40	100,30	504,05
90	84.	^,07	50,40	100,30	504,05
91	84.	^,07	50,40	100,30	504,05
92	84.	^,07	50,40	100,30	504,05
93	84.	^,07	50,40	100,30	504,05
94	84.	^,07	50,40	100,30	504,05
95	84.	^,07	50,40	100,30	504,05
96	84.	^,07	50,40	100,30	504,05
97	84.	^,07	50,40	100,30	504,05
98	84.	^,07	50,40	100,30	504,05
99	84.	^,07	50,40	100,30	504,05
100	84.	^,07	50,40	100,30	504,05
101	84.	^,07	50,40	100,30	504,05
102	84.	^,07	50,40	100,30	504,05
103	84.	^,07	50,40	100,30	504,05
104	84.	^,07	50,40	100,30	504,05
105	84.	^,07	50,40	100,30	504,05
106	84.	^,07	50,40	100,30	504,05
107	84.	^,07	50,40	100,30	504,05
108	84.	^,07	50,40	100,30	504,05
109	84.	^,07	50,40	100,30	504,05
110	84.	^,07	50,40	100,30	504,05
111	84.	^,07	50,40	100,30	504,05
112	84.	^,07	50,40	100,30	504,05
113	84.	^,07	50,40	100,30	504,05
114	84.	^,07	50,40	100,30	504,05
115	84.	^,07	50,40	100,30	504,05
116	84.	^,07	50,40	100,30	504,05
117	84.	^,07	50,40	100,30	504,05
118	84.	^,07	50,40	100,30	504,05
119	84.	^,07	50,40	100,30	504,05
120	84.	^,07	50,40	100,30	504,05
121	84.	^,07	50,40	100,30	504,05
122	84.	^,07	50,40	100,30	504,05
123	84.	^,07	50,40	100,30	504,05
124	84.	^,07	50,40	100,30	504,05
125	84.	^,07	50,40	100,30	504,05
126	84.	^,07	50,40	100,30	504,05

127	75.	-0.20	07.34	90.77	073.83
128	75.	-0.20	07.34	90.77	073.83
129	75.	-0.20	07.34	90.77	073.83
130	75.	-0.20	07.34	90.77	073.83
131	75.	-0.20	07.34	90.77	073.83
132	75.	-0.20	07.34	90.77	073.83
133	75.	-0.13	04.72	93.00	067.10
134	75.	-0.13	04.72	93.00	067.10
135	75.	-0.13	04.72	93.00	067.10
136	75.	-0.14	04.72	93.00	067.10
137	75.	-0.13	04.72	93.00	067.10
138	75.	-0.13	04.72	93.00	067.10
139	75.	-0.10	04.04	92.11	060.50
140	72.	-0.06	05.10	90.74	055.80
141	72.	-0.06	05.10	90.74	055.80
142	72.	-0.06	05.10	90.74	055.80
143	72.	-0.06	05.10	90.74	055.80
144	72.	-0.06	05.10	90.74	055.80
145	71.	-0.03	03.72	89.04	047.20
146	71.	-0.03	03.72	89.04	047.20
147	71.	-0.03	03.72	89.04	047.20
148	71.	-0.03	03.72	89.04	047.20
149	71.	-0.03	03.72	89.04	047.20
150	71.	-0.03	03.72	89.04	047.20
151	70.	-0.00	00.00	88.12	040.60
152	70.	-0.00	00.00	88.12	040.60
153	70.	-0.00	00.00	88.12	040.60
154	70.	-0.00	00.00	88.12	040.60
155	70.	-0.00	00.00	88.12	040.60
156	70.	-0.00	00.00	88.12	040.60
157	60.	-0.00	03.00	84.70	033.00
158	60.	-0.00	03.00	84.70	033.00
159	60.	-0.00	03.00	84.70	033.00
160	60.	-0.00	03.00	84.70	033.00
161	60.	-0.73	02.73	85.04	027.31
162	60.	-0.73	02.73	85.04	027.31
163	60.	-0.73	02.73	85.04	027.31
164	60.	-0.73	02.73	85.04	027.31
165	60.	-0.73	02.73	85.04	027.31
166	60.	-0.73	02.73	85.04	027.31
167	67.	-0.70	02.07	81.13	020.60
168	67.	-0.70	02.07	81.13	020.60
169	67.	-0.70	02.07	81.13	020.60
170	67.	-0.70	02.07	81.13	020.60
171	60.	-0.84	01.00	82.00	010.01
172	60.	-0.84	01.00	82.00	010.01
173	60.	-0.84	01.00	82.00	010.01
174	60.	-0.84	01.00	82.00	010.01
175	60.	-0.84	01.00	82.00	010.01
176	60.	-0.84	01.00	82.00	010.01
177	60.	-0.84	01.00	82.00	010.01
178	60.	-0.84	01.00	82.00	010.01
179	60.	-0.03	00.70	81.07	007.37
180	60.	-0.03	00.70	81.07	007.37
181	60.	-0.03	00.70	81.07	007.37
182	60.	-0.03	00.70	81.07	007.37
183	60.	-0.03	00.70	81.07	007.37
184	60.	-0.00	00.07	80.10	000.72
185	60.	-0.00	00.07	80.10	000.72
186	60.	-0.00	00.07	80.10	000.72
187	60.	-0.00	00.07	80.10	000.72
188	63.	-1.00	30.01	78.01	300.07
189	63.	-1.00	30.01	78.01	300.07
190	63.	-1.00	30.01	78.01	300.07
191	62.	-1.14	38.74	77.09	307.35
192	61.	-1.10	38.08	74.14	300.78
193	61.	-1.10	38.08	74.14	300.78
194	61.	-1.10	38.08	74.14	300.78
195	60.	-1.20	37.01	70.03	370.14
196	60.	-1.20	37.01	70.03	370.14
197	60.	-1.20	37.01	70.03	370.14
198	60.	-1.20	37.01	70.03	370.14

749	50,	-1,74	34,75	73,50	367,49
200	50,	-1,73	34,75	73,50	367,49
201	50,	-1,73	34,75	73,50	367,49
202	50,	-1,70	34,06	72,17	366,81
203	50,	-1,70	34,06	72,17	366,81
204	47,	-1,06	35,02	70,86	365,19
205	46,	-1,52	36,75	69,51	367,54
206	46,	-1,52	36,75	69,51	367,54
207	50,	-1,50	36,00	68,18	366,70
208	50,	-1,50	36,00	68,18	366,70
209	50,	-1,66	33,04	66,85	368,26
210	50,	-1,66	33,04	66,85	368,26
211	43,	-1,72	32,76	65,52	367,61
212	43,	-1,72	32,76	65,52	367,61
213	43,	-1,72	32,76	65,52	367,61
214	43,	-1,72	32,76	65,52	367,61
215	51,	-1,06	31,03	62,86	369,31
216	51,	-1,06	31,03	62,86	369,31
217	51,	-1,06	31,03	62,86	369,31
218	51,	-1,06	31,03	62,86	369,31
219	50,	-1,02	30,77	61,64	367,67
220	46,	-2,19	28,11	56,22	361,08
221	46,	-2,19	28,11	56,22	361,08